

AN ECONOMETRIC ANALYSIS OF TRENDS AND DETERMINANTS AFFECTING TEA (*Camellia sinensis*) EXPORT VALUE IN SRI LANKA

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Received: 19.09.2025; Accepted: 21.11.2025

ABSTRACT

Tea is one of most popular beverages in the world, made from *Camellia sinensis* leaves and renowned for its various flavors, caffeine content, and health benefits. Considering Sri Lankan status as a prominent tea exporter, integrated econometric studies addressing the effects of production, land use, price, and macroeconomic factors on export performance are limited. The purpose of this study is to identify and examine the key factors of Sri Lankan tea export value from 2000 to 2023, utilizing secondary time-series data from the Central Bank of Sri Lanka. The analysis takes into account variables such as tea output, total cultivated area, replanted area, production costs, Colombo auction prices, quantities sold at the auction, currency rate, and export value. A first-differenced log-linear OLS regression was employed to account for non-stationarity, while multicollinearity and structural changes were addressed through careful variable selection and dummy interactions. The findings show that Colombo auction prices and currency rate fluctuations are the most important drivers of export value, with large positive effects. Tea production and production costs have positive but moderately significant benefits, whereas total cultivated area, replanted area, and auction amounts are not statistically significant. Based on the findings, policy implications emphasize the necessity of ensuring production efficiency, price competitiveness, and macroeconomic stability, rather than depending just on increasing cultivated land to improve export performance. Overall, the study concludes that strategic interventions focusing on efficiency and market-driven factors are crucial for maintaining and improving Sri Lankan tea export performance.

Keywords: Colombo auction prices, Econometric analysis, Exchange rate, Production efficiency, Sri Lankan tea export

INTRODUCTION

Tea is a popular beverage produced from the leaves of the *Camellia sinensis* plant. It is consumed in a variety of forms and flavours all over the world, and it is most recognized for its caffeine and health advantages (D'Auria et al., 2022). Harvesting, preparing, and steeping leaves in hot water are all part of the tea-making process. Tea is classified into various varieties, each with its own flavour, colour, and preparation methods, which are determined by the extent of oxidation or fermentation of the leaves (Wong et al., 2022). When intending tea cultivation, tea is grown in tropical and subtropical areas with moderate rainfall and high elevation, and it requires fertile, well-drained soil. The leaves are normally hand-picked and processed to produce various types of teas (Jayasinghe et al., 2020; Chen et al., 2022). In Sri Lanka, the estate and smallholding sectors are the two primary industries involved in the production of tea. Currently, almost 75% of the Sri Lankan tea production comes from

smallholder farmers (Shyamalie et al., 2020). Most smallholder-owned tea lands are concentrated in the low country regions (below 300 meters above mean sea level), particularly in the Ratnapura, Galle, and Matara districts. Also, Shyamalie et al. (2020) explained that there is still a large gap between the lowest and highest production levels in the smallholdings sector, even though this sector is typically more productive than the estate sector.

The tea industry plays a crucial role in the economy of Sri Lanka by supporting rural livelihoods, creating job opportunities, and generating foreign exchange profits. Sandika (2018) explained that the tea industry plays a crucial role in the economy of Sri Lanka by supporting rural livelihoods, creating over 1.5 million job opportunities, and generating significant foreign exchange profits through increased export income. The sustainability of the tea business is seriously threatened by recent changes in the cultivated area, production volume, export amounts, and export values. The

livelihoods of thousands of smallholder farmers, plantation labours, and other participants in the tea value chain are in danger due to these trends. Inadequate comprehension of the fundamental elements influencing these patterns, such as modifications in global demand, production expenses, and ecological limitations, hinders the creation of productive policy interventions. Considering comprehensive study on Sri Lankan tea business sector, there is a deficiency of integrated econometric analyses that concurrently evaluate production efficiency, pricing dynamics, land-use variables, and exchange rate impacts on tea export performance utilizing extended time-series data. Furthermore, there is a shortage of current post-crisis (2019–2023) empirical data on Sri Lankan tea export determinants. This study aims to identify and analyze the factors influencing production and export performances of Sri Lankan tea industry with the trend analysis of determinants, thereby offering insights to assist long-term growth and competitiveness in the global market while policymakers to promote productivity, price competitiveness, and macroeconomic stability in the tea sector.

LITERATURE REVIEW

Tea sector in world

The global tea sector generates more than USD 17 billion in total output value each year, with around USD 9.5 billion coming from international trade. For low-income and rising economies, tea is a crucial source of export income (Bolton, 2022). Based on the FAO report, Bolton (2022) stated that 9 million of the 13 million people working in the tea industry are smallholder farmers, who are vital to the global tea industry. Smallholder producers accounted for 60% of global tea production in 2022, demonstrating their increasing dominance in the industry. Given that they produce 80% of the tea produced in China and Vietnam and more than 50% in India, Indonesia, Kenya, and Sri Lanka, their contribution is particularly significant in these major tea-producing nations (Bolton, 2022). The increased focus on rural livelihoods, reasonable agricultural development, and attempts to satisfy growing global demand are all factors contributing to this move towards smallholder-driven production. The percentage of tea produced by smallholders is therefore continuously rising globally, underscoring their significance for the future (Bolton, 2022).

Tea sector in Sri Lanka

The provisional data for Sri Lankan tea sector in 2023 show considerable increases in output, cultivation, and export performance. The overall cultivated area for tea in 2023 was at 269,000 hectares, with an extra 567 hectares replanted throughout the year, indicating continuous efforts to sustain and revitalize tea plantations. In terms of input utilization, approximately 61,000 metric tons (MT) of fertilizer were distributed to promote tea cultivation, highlighting the importance of inputs in increasing productivity. As a result, Sri Lanka produced roughly 256.1 million kilograms of tea in 2023. This production was aided by higher efficiency and improved input utilization, but growing production costs posed a challenge to profitability (Central Bank of Sri Lanka, 2024). The financial strain on producers, especially smallholders and plantation businesses, was highlighted by the production cost of Rs. 885 per kilogram of tea. The average auction price in 2023 was Rs. 1,188.33 per kilogram at the Colombo Tea Auction, a significant venue for determining prices for Sri Lankan tea. This represents a low profit margin in comparison to the cost of production. The Colombo auctions saw the sale of 237.6 million kilograms of tea, indicating a robust demand for Sri Lankan tea (Central Bank of Sri Lanka, 2024). When it comes to exports, 2023 provisional tea export value of Rs. 428,292 million in Sri Lanka shows how important tea export revenue to the nation. The significance of the tea industry in the national economy is demonstrated by the 0.5% GDP growth contribution it made to Sri Lanka. For rural lives, foreign exchange profits, and the larger agricultural economy, the sector's performance has a significant impact (Central Bank of Sri Lanka, 2024). These numbers highlight the continued importance of tea in Sri Lankan economy, even in the face of production costs and market volatility. The consistent demand for tea exports, ongoing productivity improvements, and tea replanting all point to a path for sustainable sectoral growth (Central Bank of Sri Lanka, 2024).

Sri Lankan tea production is impacted by several factors and confronts a number of difficulties. Factors including soil erosion, ageing tea bushes, plant diseases, the prohibition of chemical fertilizers, growing fertilizer costs, and a lack of labour are the main reasons been attributed to the decline in productivity (Fernando et al., 2023). Given that labour is the most important input for production, labour shortages is a key factor that impacts on viability of the tea industry (Jeewanthi & Shantha, 2021). Sri Lankan tea fields have an average technical efficiency of

68.81%, with paid labour, family labour, fertilizers, and chemicals being the main factors influencing tea output (Shyamalie et al., 2020). According to studies, productivity is positively impacted by labour, land, and fertilizer availability, however technical inefficiencies are associated with characteristics like tea plant age, farming experience, educational attainment, and credit availability (Jayakody & Dishanka, 2020). Furthermore, smallholder tea farmers' technical efficiency is greatly impacted by gender and extension service accessibility, with female farmers frequently encountering more obstacles in obtaining high-quality support services (Jeewanthi & Shantha, 2021). Another important factor is climate change, which presents major threats to quality and growth of tea and has a substantial impact on livelihoods of tea growers (Thankappan, 2023). According to research, maximum temperature and rainfall have a favourable effect on tea yields over the long run, whereas minimum temperature has a detrimental effect (Edirisinghe et al., 2024). Furthermore, the most significant climatic elements influencing the appropriateness of tea-growing environments have been shown to be precipitation seasonality and total annual precipitation (Jayasinghe & Kumar, 2020).

Previous research focuses on specific elements such as productivity, land usage, or prices, and is frequently short-term or descriptive. There is lack of comprehensive long-term analysis that looks at how production, pricing, land usage, and macroeconomic factors affect Sri Lankan tea export performance. Based on that conceptual framework of the study developed.

Conceptual framework

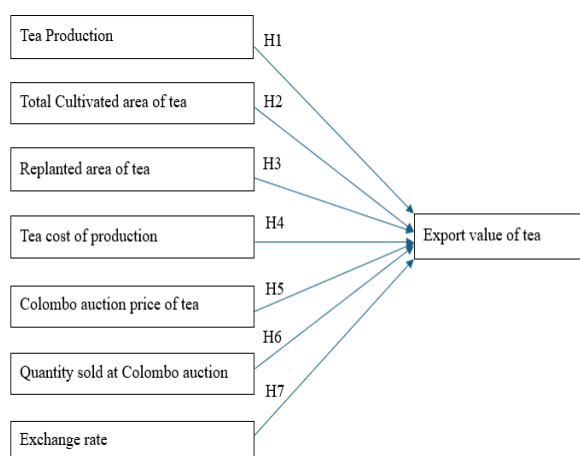


Figure 1. Conceptual framework of the study

Tea production

Although there is a correlation between the overall amount of tea produced and its export value, the type and degree of this correlation can differ. Demand, quality, and pricing are some of the worldwide market factors that affect the relationship. The amount of tea that Vietnam exports is heavily impacted by its total tea production. When national tea output varies (increases or declines), the quantity of tea exported will most likely alter in response (Nguyen et al., 2020). In Indonesia, the total tea output has a minor impact on tea export volume, however the exchange rate has a partially substantial negative impact (Inzani et al., 2021). From 2019 to 2028, Bangladesh's tea output and consumption are forecast to rise, while exports are expected to fall, emphasizing the need for government action to maintain and strengthen the tea industry (Mila et al., 2021).

Hypothesis 1: Tea production is having positive relationship with the export value of tea in Sri Lanka.

Total cultivated area of tea

Although expanding the tea-growing area can increase output, higher export values are not always the result. The success of tea exports depends on factors such as, including domestic consumption, market rivalry, quality enhancements, and effective marketing. Bangladesh and Nepal serve as examples of how increasing cultivation needs to be integrated with calculated actions to increase export value (Dhakal, 2023; Arefin & Hossain, 2022).

Hypothesis 2: Total cultivated area of tea is having positive relationship with the export value of tea in Sri Lanka.

Replanted area of tea

The replanted area of tea in Sri Lanka is crucial element impacting the tea export value in country because it directly influences both the quantity and quality of tea output. Replanting revitalizes old plantations, increases yield potential, and enables the introduction of high-quality, disease-resistant tea types, which are often more competitive in international markets (De Silva & Cooray, 2020; Mahindapala et al., 2020). In the theoretical framework, replanted areas are consistent with production-based export theories, which hold that continual investment in productive capacity is critical for improving export performance. As a result, examining replanted area helps to explain variances in

export revenue by connecting plantation renewal to long-term productivity and market competitiveness.

Hypothesis 3: Replanted area of tea is having positive relationship with the export value of tea in Sri Lanka.

Tea cost of production

The cost of tea production captures the overall expenses incurred per kilogram of tea produced, including labor, inputs, processing, and operational costs, and is used to analyze the influence on export value. Although it is more environmentally harmful, domestic tea cultivation in China is more profitable than tea exported. This implies that while environmental impacts may result in higher production costs for local consumption, exported tea benefits from lower environmental costs, which could have a favourable impact on its export value (Xu et al., 2021). Indian export goals and values have been impacted by growing production costs, including labour and environmental issues. These problems were made worse by the COVID-19 pandemic, which had an effect on production and auction prices, which in turn had an effect on export values and volumes (Hajra, 2021).

Hypothesis 4: Tea cost of production is having positive relationship with the export value of tea in Sri Lanka.

Colombo auction price of tea

The Kolkata market operated more as a price taker, while the Colombo market showed the most price-making traits. The results from Rembeza and Radlińska (2020) indicated that while pricing information from other markets has less importance for short-term judgements, it is more important for long-term ones. While Kolkata placed more weight on external market pricing information in the short term, Colombo became the dominating market over the long run.

Hypothesis 5: Colombo auction price of tea is having positive relationship with the export value of tea in Sri Lanka.

Quantity sold at Colombo auction

The strategic analysis of auctions can improve the prediction ability of economic theories, and they are a useful instrument for researching strategic behaviour in multilateral trading (Wilson, 2021). The amount of tea sold at auctions is influenced by variables such auction pricing dynamics, regional production trends, and tea taster valuations (Dalal et al., 2020). Therefore, quantity sold at Colombo auction may have an impact

on export value of tea in Sri Lanka.

Hypothesis 6: Quantity sold at Colombo auction of tea is having positive relationship with the export value of tea in Sri Lanka.

Exchange rate

While the exchange rate has a considerable impact on export value, it can have varying effects on export volume. For example, in the case of Indonesian tea, the exchange rate had a large negative influence on export volume, although this effect was less noticeable in other cases (Inzani et al., 2021).

Hypothesis 7: Exchange rate is having positive relationship with the export value of tea in Sri Lanka.

METHODOLOGY

Research design

The study uses time-series secondary data and a quantitative research design. By analyzing production, cultivated areas, production cost, auction prices, auction numbers, and exchange rate variables, the study aims to determine the factors that determine the value of tea exports in Sri Lanka. The quantitative approach makes it possible to measure the direction and strength of correlations between variables using statistical methods like regression analysis.

Operationalization of variables

In this study, every variable is quantitative and quantified using a ratio scale. Because the ratio scale has a true zero point, it enables meaningful comparisons and mathematical operations. Measurable physical or monetary units (kilograms, hectares, rupees) were used to express tea production, cultivated area, cost of production, Colombo auction prices, quantities sold, exchange rate, and export value. Regression analysis, which aims to investigate the link between production and market parameters and the export value of tea, can thus be applied to this data. Because all the variables are ratio-scaled and continuous, parametric statistical techniques were applied (Inzani et al., 2021). Tea output, total cultivated area, production costs, Colombo auction tea prices, quantities sold at auction, and the exchange rate are the independent factors in this study (table 1), whereas the export value of tea is the dependent variable (Saleh et al., 2016).

Table 1: Variables and measurement scale of the study

Variable	Measurement Scale
Tea production	Kilogram (Kg)
Total cultivated area of tea	Hectares (Ha)
Replanted area	Hectares (Ha)
Cost of tea production	Rupees/Kilogram (Rs. /Kg)
Colombo auction tea prices	Rupees/Kilogram (Rs. /Kg)
Quantities sold at the Colombo auction	Kilogram (Kg)
Exchange rate	Sri Lankan Rupees (LKR)/United State Dollar (USD)
Export value of tea	Rupees (Rs.)

Data collection

The research utilizes secondary data spanning the period from 2000 to 2023, sourced primarily from the Central Bank Reports of Sri Lanka. This extensive 23-year time frame provides a robust foundation for analyzing trends, fluctuations, and long-term patterns within the Sri Lankan tea industry. All variables have

been extracted from the most recent updated Central Bank of Sri Lanka publications, reviewed for missing values and errors, then standardized to ensure consistency over time.

Significant global and local economic events occurred during the selected period, including the global financial crisis (2007-2009), the European sovereign debt crisis (2010-2012), the COVID-19 pandemic, the ongoing Russia-Ukraine war (Kamburawala & Abeyrathne, 2024), and Sri Lankan economic downturn (2019-present). These events had a tremendous impact on the tea business, impacting production, pricing, and trade dynamics.

Data was initially compiled in Microsoft Excel for cleaning, coding, and graphical presentation before being imported into SPSS for statistical analysis. To ensure uniformity, each variable was grouped in annual observations.

Table 2: Descriptive statistics of the selected determinants

	N	Minimum	Maximum	Mean	Std. Deviation
Tea production (Mn. Kgs)	24	251.5 ^e	340.0 ^c	306.154	22.3464
Total cultivated area of tea (Ha)	24	180015 ^a	269000 ^f	217979.92	26074.490
Replanted Area (Ha)	24	567 ^f	1851 ^b	1195.04	325.371
Cost of tea production (Rs. /Kg)	24	110.64 ^a	885.00 ^f	365.6308	197.99427
Colombo auction tea prices (Rs. /Kg)	24	135.53 ^a	1270.50 ^e	435.3904	294.13706
Quantities sold at the Colombo auction (Mn. Kgs)	24	237.60 ^f	326.10 ^d	283.8804	25.42629
Exchange rate	24	80.06 ^a	363.11 ^e	146.5063	69.06331
Export value of tea (Mn. Rs.)	24	53133.000 ^a	428292.000 ^f	175114.50000	99800.633979
Valid N (listwise)	24				

^a2000, ^b2011, ^c2013, ^d2014, ^e2022, ^f2023

(Source: Central Bank Reports of Sri Lanka)

Data analysis

An Ordinary Least Squares (OLS) regression was used to assess the impact of important variables on Sri Lankan tea export value. To address non-stationarity, independent variables were log-transformed and differenced, and dummy variables with interaction terms were used to account for potential structural breaks. Multicollinearity and autocorrelation were investigated. After variables were log-transformed and differenced, the multicollinearity values become acceptable. The Durbin-Watson score of 2.719 suggests that the residuals have a little negative autocorrelation, but future research may use ARDL (Autoregressive Distributed Lag) or other time-series models to address residual correlation more formally. This approach provides credible estimates of the

parameters influencing tea export success during the 2000-2023 period.

RESULTS

The findings of the data analysis conducted to identify the factors impacting the export value of tea in Sri Lanka. The chapter opens with a descriptive study of the variables, exhibiting their changes and patterns during the period from 2010 to 2023. This is followed by the findings of correlation and regression analysis, which investigate the relationships between the variables.

Descriptive statistics of the selected determinants

As mentioned in table 2, the descriptive statistics reflect the distributional characteristics of the primary

variables utilized in the study across a 24-year time period. Tea production varies moderately, ranging from 251.5 to 340 million kilograms, with an average of 306.15 Mn. kg. The total cultivated area of tea varies greatly, with a mean of 217,980 hectares, but the replanted area remains small, averaging only 1,195 hectares. Economic variables are far more varied: the cost of tea production varies substantially from Rs. 110.64 to Rs. 885 per kilogram, and Colombo auction prices exhibit a similar spread, reflecting market swings. Quantities sold at the Colombo auction remain relatively consistent, although the exchange rate fluctuates significantly, reflecting macroeconomic trends during the period. The export value of tea has fluctuated dramatically over the last 24 years, ranging from Rs. 53,133 million to Rs. 428,292 million, with an average of Rs. 175,114.5 million. The large standard deviation indicates significant variability in export revenues, reflecting the impact of shifting production levels, prices, and economic conditions. Overall, the data show considerable changes in both production-related and economic variables, which are critical for evaluating the impact on tea export success.

Trend analysis of key determinants influencing the export value of Sri Lankan tea (2000–2023)

Trend analysis of tea production (Mn. Kgs.) in Sri Lanka (2000-2023)

According to the figure 2, the tea production in Sri Lanka between 2000 and 2023 remained reasonably consistent in the early and mid-2000s, ranging between 300 and 340 million kilos, with a slight peak around 2010-2014.

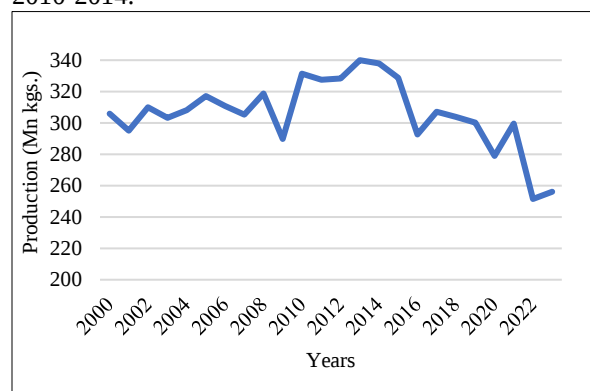


Figure 2: Trend in tea production during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

After 2015, output began to fall significantly, reaching a low of less than 270 million kg in 2022, followed by a minor recovery in 2023. The current reduction is most

likely due to poor weather, fertilizer shortages, and disruptions in labor and input supplies, especially during the 2020-2022 economic crisis (Jayasundera, 2019; Kumari & Malkanthi, 2024).

Trend analysis of total cultivated area (Ha) of tea in Sri Lanka (2000-2023)

As mentioned in figure 3, between 2000 and 2023, the total area under cultivation for tea first climbed, then stabilized at 222,000 ha between 2005 and 2013, fell after 2014, and then dramatically increased once more starting in 2020. Over the course of the time, tea production varied, it peaked in 2013 and then progressively decreased, reaching its lowest level in 2022. Overall, the movement of land area and production did not follow the same pattern, suggesting that productivity factors such as input, management, and climate were important in determining output (Omer et al., 2025; Edirisinghe et al., 2024)

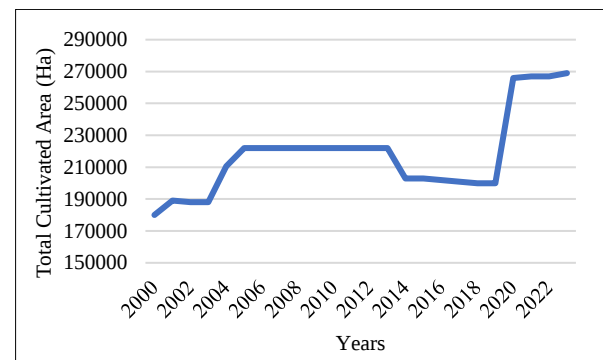


Figure 3: Trend in tea cultivated area during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

Trend analysis of replanted area (Ha) of tea in Sri Lanka (2000-2023)

The figure 4 illustrated the replanted area of tea in Sri Lanka varied significantly between 2000 and 2023. Replanting increased gradually after a very stable period in the first decade of 2000 reaching its highest level of 1,851 hectares in 2011, indicating increased efforts to revitalize aged plantations. However, the area fell dramatically starting in 2014 and reached a low of 567 Ha in 2023, with only minor returns in a few years. All things considered, the pattern shows periodic replanting activity, with a recent decline that would indicate difficulties maintaining plantation renewal.

Trend analysis of cost of tea production in Sri Lanka (2000-2023)

As mentioned in figure 5, the cost of producing tea in Sri Lanka raised gradually between 2000 and 2023, from Rs. 110.64/kg in 2000 to Rs. 638.99/kg in 2022 and then sharply to Rs. 885/kg in 2023. Growth was slow in the early years, but it increased after 2007 due to growing labor, input, and operating costs. The sharp increase in recent years is probably due to local production difficulties, increased global energy and fertilizer costs, and economic instability, all of which impose increasing pressure on the profitability of tea production (Kamburawala, & Abeyrathne, 2024; Hilal, 2020; Jayasundera, 2019).

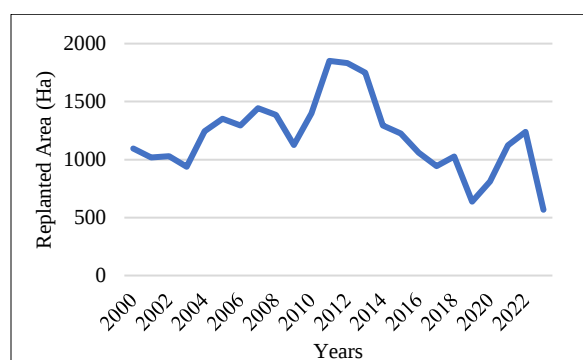


Figure 4: Trend in tea replanted area during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

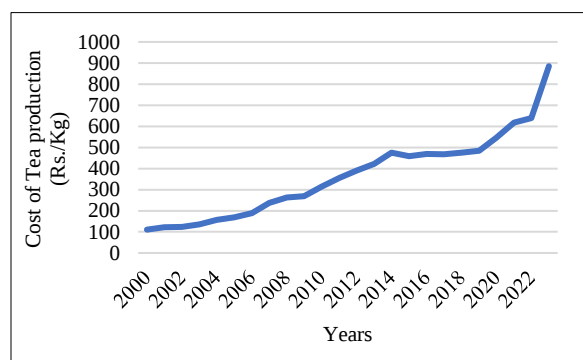


Figure 5: Trend in cost of production of tea during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

Trend analysis of Colombo auction tea prices (Rs./kg) in Sri Lanka (2000-2023)

According to figure 6, Colombo auction tea prices in Sri Lanka typically increased between 2000 and 2023, from Rs. 135.53/kg in 2000 to a peak of Rs. 1,270.5/kg in 2022 before slightly decreasing to Rs. 1,188.33/kg in 2023. Moderate rises occurred in the early years of

2000 but starting in 2007, growth accelerated due to increased demand and influences from the worldwide market. The overall trend indicates a significant long-term gain, reflecting the growing value of tea in both domestic and foreign markets, however price variations occurred in some years, such as 2011 and 2015, indicating market volatility.

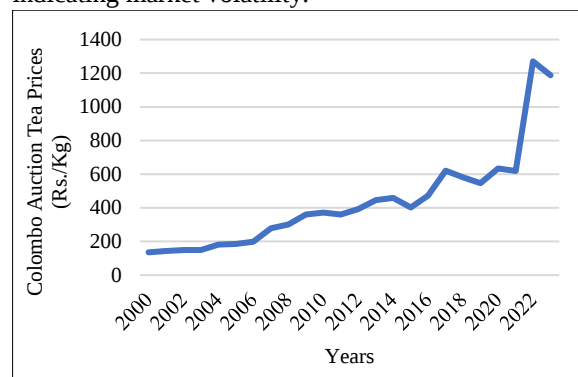


Figure 6: Trend in Colombo auction tea prices during 2000-2023 (Source: Central Bank Reports of Sri Lanka)

Trend analysis of quantities (Mn. Kgs.) sold at the Colombo auction in Sri Lanka (2000-2023)

Figure 7 illustrated that there was not a noticeable long-term rise or negative trend in the amounts of tea sold at the Colombo auction between 2000 and 2023. Sales high in 2014 at 326.1 million kilograms, with a low of 237.6 million kilograms in 2023. Moderate fluctuations occurred in the early years of 2000 followed by occasional increases from 2010 to 2014. Auction volumes consistently decreased after 2015, hitting their lowest points in 2022–2023. This suggests decreased market throughput, which could be the result of decreased output, a shift to direct exports, or changes in both domestic and foreign demand patterns.

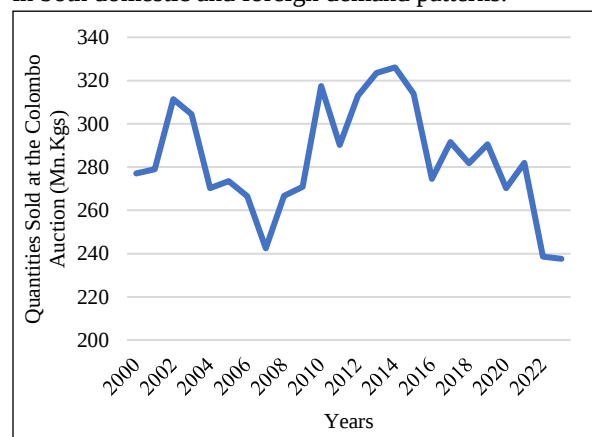


Figure 7: Trend in quantities sold at the Colombo auction during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

Trend analysis of exchange rate (LKR/USD) in Sri Lanka (2000-2023)

The Sri Lankan Rupee (LKR) depreciated over time in relation to the US dollar between 2000 and 2023 as mentioned in figure 8. The exchange rate increased from LKR 80.06/USD in 2000 to a peak of LKR 363.11/USD in 2022 before somewhat strengthening to LKR 323.92/USD in 2023. Early on, there was a slow depreciation, but after 2015, there were more noticeable rises due to growing economic difficulties, inflation, and problems with external debt. Significant volatility and economic instability during the past ten years are highlighted by the sharp increase in 2022, which points to a period of severe currency crisis (Ranasinghe, 2025; Damayanthi & Gunawardhana, 2021; Gunaruwan & Liyanage, 2024; Siyara & Perera, 2023).

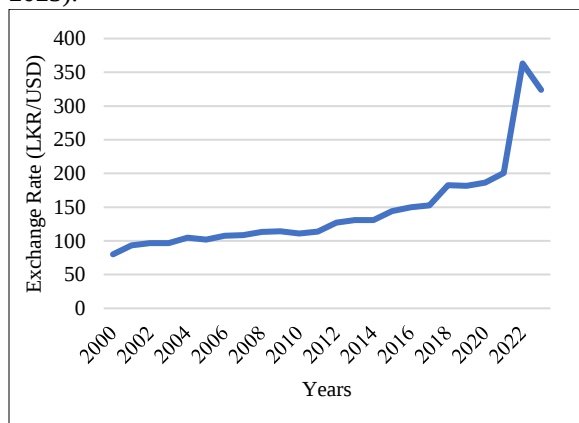


Figure 8: Trend in exchange rates (LKR/USD) during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

Trend analysis of export value (Rs. Mn.) of tea in Sri Lanka (2000-2023)

According to figure 9, Sri Lankan tea exports increased significantly between 2000 and 2023, from Rs. 53,133 million in 2000 to Rs. 428,292 million in 2023. Growth was consistent in the early years of 2000 but after 2007 it became more noticeable due to increased worldwide demand, better quality, and higher global prices. There were some swings in 2009, 2015, and 2020, most likely as a result of external economic variables or market volatility. The notable increase in tea export earnings during the time is highlighted by the strong surge in 2022–2023, which coincides with sharp increases in auction prices and exchange rate effects (Rathnayaka & Dunusinghe, 2023).

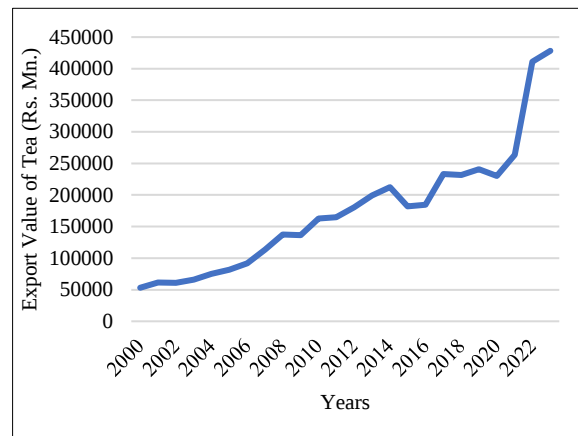


Figure 9: Trend in export value of tea during 2000-2023. (Source: Central Bank Reports of Sri Lanka)

Key determinants of export value of tea in Sri Lanka

In this study, log-transformed and differenced values were used rather than raw values to facilitate the investigation of the relationship between tea export value and its factors. Log transformation minimizes skewness and linearizes nonlinear interactions, which are common in economic data (West, 2021). This approach produces more meaningful and interpretable findings while adhering to the regression analysis assumptions.

Correlation analysis of selected determinants to export value of tea

Log-transformed and differenced variables were used to produce Pearson correlation coefficients, which are correct for skewness, stabilize variance, and facilitate elasticities analysis (Table 3). The analysis assists in determining which elements are highly connected with export performance, as well as providing preliminary insights into potential drivers for future regression analysis.

Multivariate assumptions of selected determinants

As indicated in table 4, the collinearity diagnostics show that multicollinearity is appropriate for the majority of explanatory factors. Tolerance levels are all more than the widely accepted threshold of 0.10, and matching Variance Inflation Factor (VIF) values are less than the critical value of 10, indicating that the model does not contain severe multicollinearity. However, these values are still within acceptable ranges for OLS estimation. Overall, the findings indicate that the calculated coefficients are reliable and

that multicollinearity does not significantly alter regression result.

Table 4: Multicollinearity statistics of selected determinant Coefficients^a

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constant)		
d_in_tea_production	0.174	5.751
d_in_total_cultivated_area	0.671	1.491
d_in_replanted_area	0.443	2.259
d_in_cost_of_production	0.577	1.732
d_in_Colombo_auction_price	0.467	2.140
d_in_quantities_sold_at_the_Colombo_auction	0.273	3.661
d_in_exchange_rates	0.354	2.821

a. Dependent Variable: d_in_export_values

Regression analysis

Ordinary Least Squares (OLS) regression analysis is used to model export value as a function of all selected

determinants, providing for an estimate of the amount and importance of each variable's effect. This approach provides a more thorough understanding of the fundamental elements impacting tea export performance and makes elasticities easier to interpret when differenced log-log models are utilized.

Model summary

The regression model explains a significant percentage of the variation in changes in tea export value (table 5). The R-square value of 0.853 suggests that changes in tea production, total cultivated area, replanted area, production cost, Colombo auction prices, amounts sold at the auction, and currency rate account for roughly 85.3% of the variation in the dependent variable. The adjusted R-square of 0.785 demonstrates that the model's explanatory power remains robust after accounting for the number of predictors. The model is statistically significant ($F = 12.470$, $p < 0.001$), showing that the explanatory variables together have a substantial effect on variations in tea export value in Sri Lanka.

Table 3: Correlation coefficients of key determinants affecting export value of tea

		Correlations							
		EV	TP	TCA	RA	COP	CAP	QSCA	ER
d_in_export_values (EV)	Pearson Correlation	1							
	Sig. (2-tailed)								
d_in_tea_production (TP)	Pearson Correlation	-0.043	1						
	Sig. (2-tailed)	0.423							
d_in_total_cultivated area (TCA)	Pearson Correlation	-0.164	-0.156	1					
	Sig. (2-tailed)	0.228	0.238						
d_in_replanted_area (RA)	Pearson Correlation	0.181	0.115	0.362	1				
	Sig. (2-tailed)	0.205	0.301	0.045**					
d_in_cost_of_production (COP)	Pearson Correlation	0.171	0.275	0.133	-0.132	1			
	Sig. (2-tailed)	0.217	0.102	0.273	0.274				
d_in_Colombo_auction_price (CAP)	Pearson Correlation	0.755	-0.521	0.096	0.220	-0.059	1		
	Sig. (2-tailed)	0.000**	0.005**	0.331	0.156	0.395			
d_in_quantities_sold_at_the_Colombo_auction (QSCA)	Pearson Correlation	-0.073	0.761	-0.257	-0.144	-0.029	-0.445	1	
	Sig. (2-tailed)	0.371	0.000**	0.118	0.256	0.448	0.017**		
d_in_exchange_rates (ER)	Pearson Correlation	0.535	-0.566	-0.021	0.306	-0.358	0.665	-0.438	1
	Sig. (2-tailed)	0.004**	0.002**	0.461	0.078*	0.047**	0.000**	0.018**	

** Correlation is significant at the 0.05 level (two-tailed)

* Correlation is significant at the 0.05 level (one-tailed)

ANOVA table

According to table 6, the ANOVA findings show that

the regression model is statistically significant overall. The F-statistics of 12.470 with 7 predictor factors and 15 degrees of freedom for the residuals is significant at

the 1% level ($p = 0.000$), showing that the explanatory variables work together to have a substantial effect on changes in tea export value. The regression sum of squares (0.267) accounts for a significant amount of the overall variation (0.313), demonstrating the good

explanatory power of the model. These findings support the use of OLS regression to identify the important factors influencing tea export performance throughout the research period.

Table 5: Regression model summary

Model	R	R Square	Change Statistics				Durbin-Watson
			Adjusted Square	R Change	R Square Change	Sig. F Change	
1	.924 ^a	.853	.785	.853	12.470	.000	2.719

a. Predictors: (Constant), d_in_exchange rates, d_in_quantities sold at the Colombo auction, d_in_replanted area, d_in_total cultivated area, d_in_tea production, d_in_cost_of_production, d_in_Colombo_auction_price

b. Dependent Variable: d_in_export value

Table 6: ANOVA table

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	0.267	7	0.038	12.470	.000 ^b
Residual	0.046	15	0.003		
Total	0.313	22			

a. Dependent Variable: d_in_export value

b. Predictors: (Constant), d_in_exchange rates, d_in_quantities sold at the Colombo auction, d_in_replanted area, d_in_total cultivated area, d_in_tea production, d_in_cost_of_production, d_in_Colombo_auction_price

Coefficient table

The regression results as mentioned in table 7 showed that changes in Colombo auction prices and exchange rates have a statistically significant and positive effect on tea export value. The coefficient for the change in Colombo auction prices is positive and highly significant ($B = 0.548$, $p < 0.01$). This indicates that rises in auction prices lead to considerable increases in export value. This variable has the highest standardized coefficient ($\beta = 0.814$), making it the most significant predictor of tea export performance in the short run. Changes in the exchange rate have a positive and statistically significant influence on export value ($B = 0.367$, $p < 0.05$), indicating that depreciation increases export revenues. Changes in tea output have a positive influence on export value and are marginally significant at the 10% level ($B = 0.923$, $p = 0.051$), showing that production increases contribute to export growth, but with a weaker effect than price-related factors. The change in production costs also indicates a positive but modestly significant connection ($B = 0.350$, $p = 0.093$), which could be attributed to cost

pass-through effects in export pricing. However, there is no statistically significant change in the overall cultivated area, replanted area, or amounts sold at the Colombo auction, suggesting that short-term variations in land usage and auction volumes have no effect on export value. Additionally, assuming all explanatory variables are constant, the constant term is statistically insignificant, indicating that there is no systematic change in export value of tea in Sri Lanka.

DISCUSSION

Impact of tea production on the export value of tea in Sri Lanka

The findings show that there is a positive correlation between tea production and tea export value, which means that improvements in tea output typically result in higher export profits. According to the computed coefficient ($B = 0.923$), increased production volumes encourage export growth by expanding the amount available for foreign markets. At the 10% level, the relationship is only marginally significant ($p = 0.051$),

suggesting a modest level of statistical support. This suggests that while production growth is important, it has less of an impact on export value than price-related factors such as Colombo auction prices and exchange rate fluctuations, which have a greater influence on export revenues in the short term. The findings are further compatible with Lin (2025) and Jagadeesh et al. (2024)

which highlight the relationship between tea production and export is complex, with production volume being just one factor influencing international market supply and revenue. Therefore, tea production is having significant positive impact with the export value of tea in Sri Lanka.

Table 7: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-0.004	0.022		-0.193	0.850
d_in_tea_production	0.923	0.434	0.504	2.124	0.051
d_in_total_cultivated_area	-0.251	0.213	-0.142	-1.176	0.258
d_in_replanted_area	-0.044	0.070	-0.093	-0.623	0.542
d_in_cost_of_production	0.350	0.195	0.234	1.795	0.093
d_in_Colombo_auction_price	0.548	0.097	0.814	5.630	0.000
d_in_quantities_sold_at_the_Colombo_auction	0.060	0.278	0.041	0.215	0.833
d_in_exchange_rates	0.367	0.151	0.405	2.437	0.028

a. Dependent Variable: d_in_export_values

Impact of total cultivated area of tea on the export value of tea in Sri Lanka

The findings demonstrate that the value of tea exports is not statistically significantly affected by variations in the total area under cultivation. Short-term changes in cultivated area do not significantly affect export revenues, while the calculated coefficient being negative ($B = -0.251$) and the relationship not being statistically significant ($p = 0.258$). This implies that, especially in the short term, either increasing or decreasing the amount of land used for tea production does not directly result in a higher export value. Rather, land expansion seems to have less of an impact on export performance than productivity-related factors like pricing circumstances, management strategies, and yield improvements. Similar findings are echoed in other studies, which show that increasing cultivated areas alone does not guarantee higher export volumes (Arbella & Widodo, 2023; Nursodik et al., 2022; Inzani et al., 2021; Setiawati et al., 2020). Therefore, total cultivated area of tea is not having significant positive impact with the export value of tea in Sri Lanka.

Impact of replanted area of tea on the export value of tea in Sri Lanka

The findings show that the value of tea exports is not statistically affected by changes in the replanted area ($B = -0.044$, $p = 0.542$). This implies that replanting operations do not instantly result in increased tea export revenue in the short term. Replanting is a long-term investment that usually benefits back after a few years in terms of improved quality and yield. As a result, the negligible short-term impact is anticipated and emphasizes the lengthy gestation period linked to productivity increases from replanting initiatives. Replanting subsidies do not instantly increase tea production in the short term, with significant effects only after a one-year lag (De Silva & Cooray, 2020), and the study did not find a direct significant link to export value. Replanted area of tea is not having significant positive impact with the export value of tea in Sri Lanka in short run.

Impact of cost of tea production on the export value of tea in Sri Lanka

There is a moderately significant but positive relationship between changes in tea production costs and export value ($B = 0.350$, $p = 0.093$). This suggests that higher export values partially reflect increases in production costs, perhaps as a result of cost pass-

through mechanisms or better quality brought about by increased input consumption. Nevertheless, there is only moderate statistical support for the relationship, as it is only significant at the 10% level. This result implies that although production costs have an impact on export revenues, it is not as strong as those of market-driven variables like pricing and exchange rates. This relationship is economically justifiable because greater production costs frequently result in higher Colombo auction prices, which influence export revenue. Jayaratne (2011) noted that the Sri Lankan tea industry faces challenges from increasing global competition and production costs, which are reducing export earnings. Kamburawala & Abeyrathne (2024) actually noted that Sri Lankan tea competitiveness has been declining, suggesting production costs might negatively impact pricing.

Impact of Colombo auction tea prices on the export value of tea in Sri Lanka

Tea export value is strongly and statistically significantly positively impacted by changes in Colombo auction tea prices ($\beta = 0.814$, $B = 0.548$, $p < 0.01$). Price changes at the Colombo auction are the most significant short-term influence of export revenues, according to this greatest standardized coefficient of this variable. The value of exported tea is directly increased by higher auction prices, highlighting the significance of branding, quality enhancements, and advantageous international market circumstances in boosting Sri Lankan tea export performance. Studies from India and Kenya show that auction prices are a key determinant of export prices (Hajra, 2021). The Colombo Tea Auction accounts for 70% of Sri Lankan tea exports, making it a crucial price-setting and marketing institution in the supply chain. Its prices are heavily influenced by quality, grade, and sensory qualities, all of which play important roles in determining individual lot values and perceived export worth. Quality-based monetary assessments and auction prices are crucial for preserving Sri Lankan premium posture and earning higher unit export prices (Seneviratne & Weerasingha, 2024; Rodrigo et al., 2025).

Impact of tea quantities sold at the Colombo auction on the export value of tea in Sri Lanka

The findings indicate that variations in quantities sold at the Colombo auction have no statistically significant effect on export value ($B = 0.060$, $p = 0.833$). This shows that fluctuations in auction volumes do not have

a substantial impact on export earnings. The findings show that price changes drive export value more than quantity variations, supporting the assumption that value addition and price competition are more important than volume increase in the tea export market. The models highlight that price, rather than quantity, acts as the main catalyst for both production and export value (De Silva et al., 2014). Also, Sankalpana et al. (2018) highlighted that the net quantity of tea lots does influence auction price formation to some extent but not export value directly.

Impact of exchange rates on the export value of tea in Sri Lanka

Exchange rate changes have a positive and statistically significant impact on tea export value ($\beta = 0.405$, $B = 0.367$, $p = 0.028$). This demonstrates that the depreciation of Sri Lankan rupee against the US dollar boosts export earnings by increasing price competitiveness in international markets. The findings emphasize the relevance of macroeconomic conditions in driving export success and imply that exchange rate swings play a significant influence in determining short-run volatility in tea export values. When the rupee falls, Sri Lankan tea becomes more affordable and competitive in foreign markets, driving up demand and increasing export revenue in local currency terms. The statistical significance underlines the robustness of this relationship, which reflects the true economic impact of exchange rate variations on tea export performance. Recent studies using time-series and panel data models confirm that exchange rate volatility and depreciation of the LKR are positively and significantly associated with higher export earnings for tea. This effect is more pronounced in the long run, as exporters benefit from increased competitiveness when the LKR weakens against the USD (Rathnayaka & Dunusinghe, 2023; Rathnayaka & Dunusinghe, 2022).

CONCLUSIONS

The determinants impacting tea export value in Sri Lanka were investigated using time-series data from 2000 to 2023 and an OLS regression framework. The findings show that tea export performance is predominantly influenced by pricing dynamics and macroeconomic conditions, specifically Colombo auction tea prices and currency rate fluctuations, which have strong and statistically significant positive effects. Tea production and production costs have moderate positive benefits, although total cultivated area, replanted land, and amounts sold at the Colombo

auction have no substantial short-term impact on export value. These data show that raising productivity, preserving price competitiveness, and guaranteeing macroeconomic stability are more successful ways for increasing tea export revenues than simply expanding planted area.

This research is important because it presents a long-term, comprehensive econometric analysis of the fundamental determinants impacting Sri Lankan tea export value, emphasizing the dominance of pricing dynamics and exchange rate swings over land expansion. A significant disadvantage is that the research is based on first-differenced OLS, which does not capture long-run correlations that could be better investigated using ARDL or cointegration techniques. According to the findings, governmental initiatives should focus on enhancing production efficiency, cost management, quality-based pricing at the Colombo Tea Auction, and macroeconomic stability in order to boost exports. To acquire a better

understanding of Sri Lankan tea export competitiveness, future studies should use ARDL models, include quality and climatic variables, and use disaggregated export market data.

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